

## THE EFFECT OF INITIAL ABILITY ON STUDENTS' CRITICAL THINKING SKILLS

Ihwan Zulkarnain<sup>1\*</sup>, Diah Oga Nusantari<sup>2</sup>, Silvia Septhiani<sup>3</sup>

<sup>1,2,3</sup>Department of Mathematics Education, Faculty of Mathematics and Natural Sciences,  
Indraprasta PGRI University Jakarta,  
Jl. Nangka No. 58C, Tanjung Barat, South Jakarta, Indonesia.

### ABSTRACT

This study aims to determine the effect of initial ability on critical thinking skills in class VIII students at Adzkiya Islamic Junior High School, Bogor Regency. The research method used is quantitative research with correlational survey method. The population of this study were all grade VIII students at Adzkiya Islamic Junior High School, Bogor Regency, totalling 90 students with *random sampling* technique. The research instrument used was a questionnaire of initial ability and critical thinking ability test instrument. Data analysis techniques were carried out with correlation tests and simple regression tests. The results showed that there was an effect of initial ability on the critical thinking ability of VIII grade students at Adzkiya Islamic Junior High School, Bogor Regency as evidenced by the value of *thitung* = 12.65 dan *ttabel* = 0.695, with the amount of influence contribution only 1.21%.

**Keywords:** early mathematical ability, critical thinking.

### 1. Introduction

Education aims, among other things, to optimise all the potential of learners in order to create skills as a provision when in the community environment, which will later become a valuable asset for the nation and state. Thus, education is considered important as an actor of change and development in society. In real situations and conditions, the potential of students is still considered not optimally achieved by education, especially in formal education. In formal education, mathematics is one of the subjects that is still considered difficult by students. Agreeing with this, Arviana, et. al., (2020) stated that mathematics is one of the subjects that is still considered difficult by students. The results of tests and evaluations in 2018 conducted by the *Programme for International Students Assessment* (PISA) reported that the average score in mathematics reached 379 with an *Organisation for Economic Cooperation and Development* (OECD) average score of 487 (kemendibud.go.id). The same thing was also presented by Putri, et. al., (2022) based on the results of the 2018 PISA test, Indonesia ranked 6th bottom or ranked 74 out of 79. Therefore, PISA

states that Indonesia is still relatively low in mastering the material.

The importance of learning mathematics cannot be separated from the role of mathematics in all aspects of life, including to improve the ability to think logically, critically, analytically, systematically, and creatively as self-actualisation of students in solving problems in everyday life. But in reality, it is often found that students are relatively weak in their ability to solve problems in everyday life. Salmaniah, et. al. (2016) stated that students who have a high level of disposition tend to have high problem solving skills compared to students who have a low level of mathematical disposition. Scientifically, it has been proven that a good mathematical disposition in students, will be able to make good problem solving skills also in these students. This is certainly one of the foundations of thinking and behaving for mathematics teachers to always build mathematical disposition in students in every mathematics learning activity. This different critical thinking ability is what causes some of the students to feel that they are unable to solve problems in the learning process.

Aditya, Eko, and Vijanti (2013: 135) stated that critical thinking is applying rational thinking

\*) Corresponding Author.

E-mail: [irvan\\_arie@yahoo.com](mailto:irvan_arie@yahoo.com)

Phone: +6281224026430

in high thinking activities including analysing, synthesising, recognising problems and their solutions, concluding, and evaluating. Critical thinking skills in learning mathematics are used to gain deep understanding. This is supported by the statement of Rokhimah and Rejeki (2018) who said that the critical thinking process requires open-mindedness, humility, and patience where these qualities help a person achieve deep understanding. However, in reality, students' critical thinking skills are still low which results in students' understanding of mathematics subjects being low as well. This has an impact on students' mathematics learning outcomes.

In learning activities, students' critical thinking skills must always be developed to be able to solve these mathematical problems. This is confirmed by Aldilah, et. al. (2019) who stated that the *student-centred* paradigm is more appropriate for developing *self-regulated* learners who are able to empower critical thinking skills. To face the rapid changes in the world is to form a culture of critical thinking in society. The main priority of an education system is to educate students on how to learn and think. According to Kartin, et. al. (2023) critical thinking in learning mathematics is something that is very important for students, because with critical thinking learners will be confident and easily adapt to mathematical problems. Critical thinking in mathematics will help learners to be able to apply mathematical concepts in daily activities.

In learning mathematics, prior knowledge is needed because one mathematical concept with another mathematical concept is interrelated. The mathematical knowledge that students know beforehand becomes the basis of understanding to learn the next material so that this initial ability is considered to predict the success of student learning for the future, both in studying mathematics, physics, chemistry, and other sciences at large. Students with high initial abilities are relatively quick to master lessons and their grades are generally good, while students with low initial abilities tend to be slow to learn and their grades are relatively poor. (Haeruman, et. al., 2017). Based on this description, the researcher is interested in conducting research on the effect of initial ability on students' critical thinking skills.

## 2. Research Methods

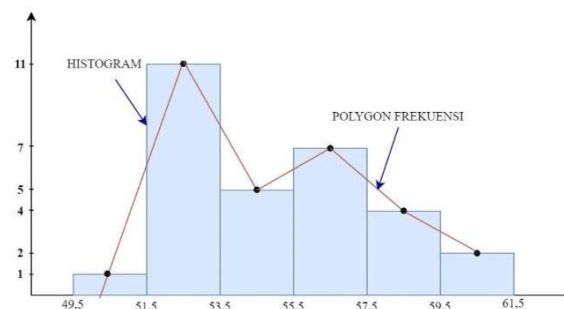
This research was conducted at Adzkiya Islamic Junior High School, Bogor Regency. The method used was a correlational survey method. According to Yusuf (2017) a survey is a way to collect information from a large number of individuals using questionnaires, interviews, or *by mail or telephone*. While correlational research is that researchers use statistical analysis techniques to aim for the relationship of two or more variables without drawing general conclusions (Setyosari, 2013).

The affordable population in this study were students of class VIII Islam Adzkiya, Bogor Regency in the 2021/2022 academic year, totalling 90 students. The sampling technique used is *sample random sampling*. According to Morissan (2016: 45) that sample random sampling where each individual (subject), element, event, or unit in the population has the same opportunity to be selected as a sample member. So, in this sample the population can be taken randomly without regard to the class in the study.

The data collection techniques used in this study include students' initial abilities using a questionnaire of 20 questions and mathematical critical thinking skills taken using an essay test of 7 questions that have been tested for validity and reliability.

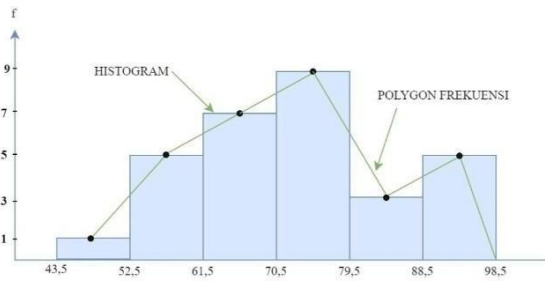
## 3. Results and Discussion

Based on the questionnaire of the initial ability level of class VIII students during mathematics lessons.



Histogram and Polygon of Students' Initial Ability Levels

Based on the histogram and polygon graphs as shown above, it can be seen that students who have an initial level of ability in mathematics and get the highest score between 59.5 - 61.5 are 2 students or 6.7% and then there is the lowest score between 49.5-51.5, totalling 1 student or 3.3%.



**Histogram and Polygon of Critical Thinking Ability**

Based on the histogram and polygon graph as shown above, it can be seen that students who have critical thinking skills get the highest score between 89 - 98 totalling 5 students or 16.7% and then there is the lowest score between 44 - 52 totalling 1 student or 3.3%.

**Table 1.** Summary of data on students' initial ability level and critical thinking skills

Statistics	Initial Ability	Critical Thinking
Lowest score	44	44
Highest score	61	98
Mean	55,3	73
Median	54,7	72,5
Mode	52,75	72,75
Variance	139.573,4	158,275
Standard deviation	373,6	12,58

Based on the above data from 30 students, the average value of critical thinking is higher than the 30 students' average value of initial ability. Likewise with the median value and mode value, the critical thinking ability obtained a higher value compared to the initial ability. The lowest and highest values in initial ability are lower than in critical thinking ability, then the mean, median and mode values in the control class do not show a very large positive, meaning that the number of students who score below the average in the control class is more and the number of students who score above the average. So it can be seen that the average critical thinking ability of students is higher than the average initial ability of students. Verbal hypothesis tested:

$H_0$  : There is no relationship between initial self-efficacy level and mathematical critical thinking ability.

$H_1$  : There is a relationship between initial ability level and mathematical critical thinking ability.

$$r_{xy} = \frac{n \cdot (\Sigma XY) - (\Sigma X)(\Sigma Y)}{\sqrt{(n \cdot \Sigma X^2) - (\Sigma X)^2} \sqrt{(n \cdot \Sigma Y^2) - (\Sigma Y)^2}}$$

$$r_{xy} = \frac{30 \cdot (3.594.864) - (1646)(2184)}{\sqrt{(30 \times 2.709.316) - (1646)^2} \sqrt{(30 \times 4.769.856) - (2184)^2}}$$

$$r_{xy} = \frac{104.251.056}{104.250.101}$$

$$r_{xy} = 1,1$$

The coefficient of determination is denoted by  $r^2$ . based on the results there is a relationship between the level of initial ability and critical thinking ability of ( $r = 1.1$ ). The effect of initial ability on mathematical critical thinking ability is 1.21% and the rest is influenced by other variables.

The significant correlation test is used to test the magnitude or strength of the relationship between the variables tested to be equal to zero. significant correlation coefficient 63 The real level ( $\alpha$ ) 5% for a 2-way test ( $\alpha/2 = 0.025$ ) with degrees of freedom (dk)  $n - k = 28$ . The *ttabel* value of the real level 0.025 and  $dk = 28$  is 2.04841.

$$t = r \sqrt{\frac{n - 2}{1 - r^2}}$$

$$t = 1,1 \sqrt{\frac{30 - 2}{1 - (1,1)^2}}$$

$$t = 1,1 \sqrt{133,33}$$

$$t = 12,65$$

Based on the calculation results, the value *thitung* > *ttabel* is  $12.65 > 2.0481$ , so the hypothesis rejects  $H_0$  and accepts  $H_1$ . Thus, it can be concluded that there is an influence between the level of initial ability and critical thinking ability. So it can be interpreted that the higher the level of initial ability, it will affect students' mathematical critical thinking skills and vice versa, because students who have a high level of ability in mathematics will be confident in the abilities obtained at school so that it will be easier to work on problems. Meanwhile, children who have a low level of initial ability will tend to have difficulty working on maths problems, because from the start they do not have the will. They will tend to give up when working on maths problems and not want to think critically.

It can be seen that students of SMP Islam Adzkiya, Bogor Regency who have high critical thinking skills, these students are not disturbed by the noise made by their friends who are looking for answers and focus on working on the problems given. This study has successfully proven that initial ability has an influence on students'

mathematical critical thinking skills, this is evidenced by the value of  $t_{hitung} > t_{tabel}$  or  $12.65 > 2.04841$ . However, the contribution of this influence is only 1.21%.

Initial ability is the ability that students already have before they take part in the learning that will be given. Students' initial abilities are important for the teacher to know before he starts with his learning, because then it can be seen whether students already have or knowledge which is a *prerequisite* for participating in learning and to what extent students already know what material will be presented. According to Sumantri in Razak (2017) argues that "The initial ability of students is the ability that students already have before they take part in the learning that will be given. Then according to Atwi Suparman (Razak, 2017) argues that "initial ability is the knowledge and skills that students already have so that they can follow the lesson well. In students learning mathematics, the domain measured in students is the domain of the initial ability to learn mathematics. There are several factors that cause initial ability to have only a small effect on students. Factors from within the student (internal factors) and factors from outside the student (external). In terms of internal factors, the student has poor motivation and learning habits, such as not doing the problems given, and likes to joke when the teacher is talking in front of the class. In terms of external factors, the student's learning facilities are incomplete, such as not having a notebook.

#### 4. Conclusion

Based on research conducted by the author on class VIII students at Adzkiya Islamic Junior High School, Bogor Regency, it can be concluded that there is an influence between initial ability on critical thinking, this is evidenced by the calculated t value of  $12.65 > t_{table}$  of 2.04841 with the amount of influence contribution of only 1.21%.

#### 6. References

Arviana, A., Syahrifuddin, & Antosa, Z. (2020). Analysis of the Causes of Low Student Learning Outcomes in Mathematics Class IVB SD Negeri 147 Pekanbaru. *Proceedings of the National Seminar on Elementary School Teacher Education, Faculty of Teacher Training and Education Sciences, Riau University Pekanbaru*. 28-32.

Putri, A, M, A, U., Ningtyas, Y, D, W, K., & Galatea, C, K. (2022). Development of Programme For International Student Assessment (PISA) Model Mathematics Problem Quantity Content in Jember Cultural Context. *Journal of Mathematics and Mathematics Education*, 11(2), 164-179.

Salmaniah, F., Yusmin, E., & Nursangaji, A. (2016). Students' Mathematical Disposition in View of Problem Solving Ability. *Journal of Education and Learning*, 5(6), 1-12.

Aditya, D., Suryanto, E., & Viyanti. (2013). The Effect of Critical Thinking Ability and Learning Style on Learning Outcomes. *Journal of Physics Learning*, 1(3), 133-141.

Rokhimah, S., & Rejeki, S. (2018). Critical Thinking Ability of Students Based on Learning Style in Learning with 4K Model. *Journal of Research in Mathematics Didactics*, 2(1), 1-13.

Aldilah, M, A, S., Hala, Y., & Muis, A. (2019). The Effect of *Discovery Learning* Model Application on Biology Learning Outcomes of X MIA class students at SMA Negeri 1 Wonomulyo. *Proceedings of the National Biology Seminar IV*, 422-427.

Kartin, Y., Arjudin, Novitasari, D., & Hayati, L. (2023). Analysis of Students' Critical Thinking Ability Based on Mathematical Logical Intelligence. *Journal of Classroom Action Research*, 5(3), 35-41.

Haeruman. (2017). The Effect of Discovery Learning Model on Improving Critical Thinking Ability. *JPPM*, 10(2), 147-168

Yusuf, M, A. (2017). *Research Methods: Quantitative, Caulitative and Combined Research* (p. 62). Jakarta: Kencana.

Setyosari, P. (2013). *Education and Development Research Methods* (p. 45). Jakarta: Kencana.

Morissan. (2016). *Survey Research Methods* (p. 45). Jakarta: Kencana.

Razak, F. (2017). The Relationship between Initial Ability and Critical Thinking Ability in Mathematics in Class VII Students of Pasantrem

*Ihwan Zulkarnain*

Immin Putri Minastene Junior High School.  
*Mosharafa Journal*, 6(1), 117-28.